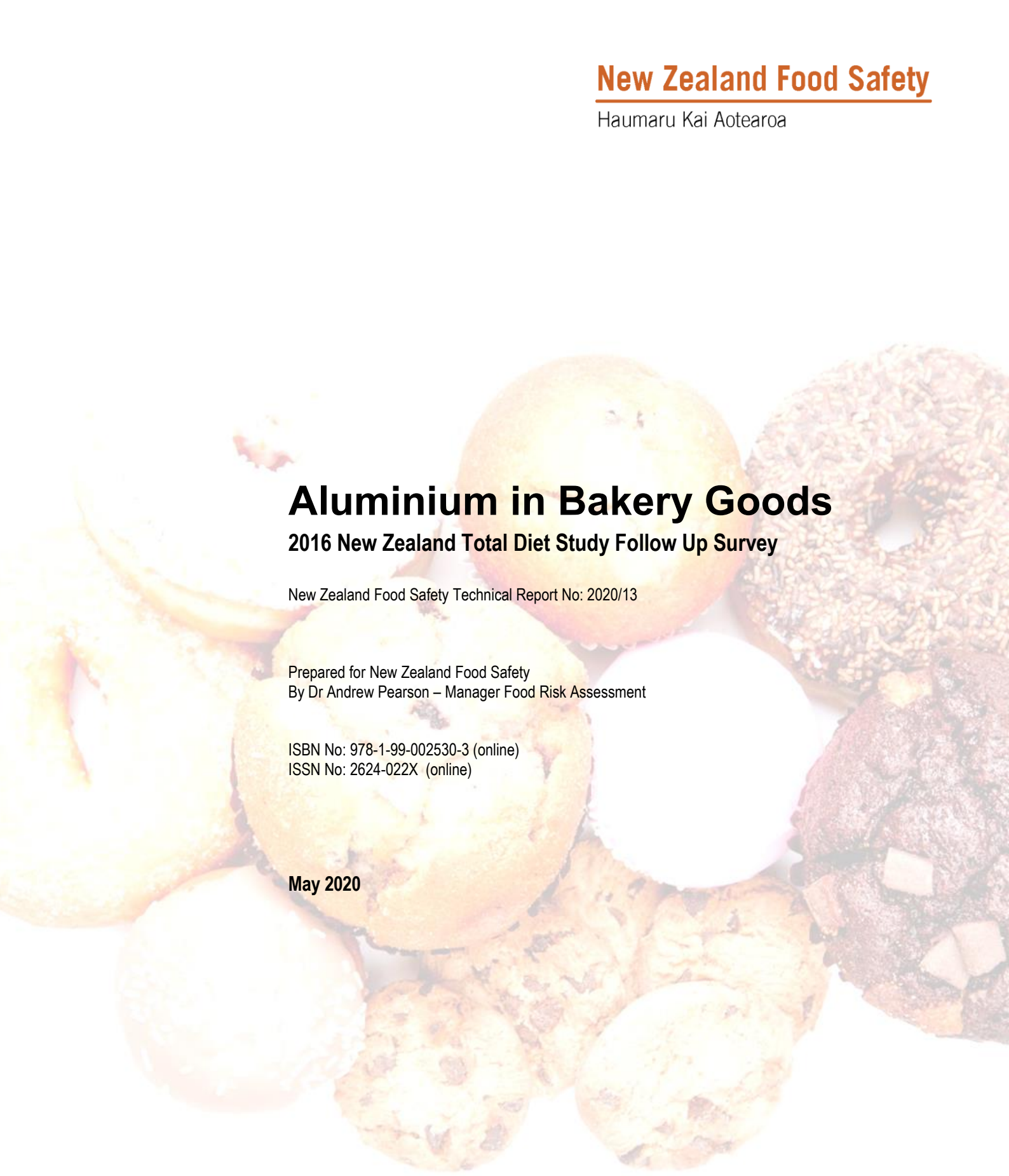
New Zealand Food Safety
Haumaru Kai Aotearoa



Aluminium in Bakery Goods

2016 New Zealand Total Diet Study Follow Up Survey

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Contents

Common abbreivations:

ICP-MS: Inductively coupled plasma mass spectrometry

LOR: limit of reporting

mg/kg : miligram per kilogram food commoditiy

mg/kg bw/day: miligram per kilogram of bodyweight per day

NZTDS: New Zealand Total Diet Study

SAlP: Sodium aluminium phosphate

1 Executive Summary

Analysis of aluminium in the 2016 New Zealand Total Diet Study (NZTDS) identified high concentrations in muffins and scones, and cakes and slices (Pearson et al., 2018). The consequence of which was that potential exposures for younger age groups were considered to be of potential dietary concern. Following the publication of the 2016 NZTDS) New Zealand Food Safety engaged with industry to phase-out and replace the food additive sodium aluminium phosphate (SAlP) that was leading to the high aluminium concentrations in bakery goods.

A survey of bakery goods was undertaken in April 2019 to establish the progress towards phasing out the use of SAlP in baking recipes and characterise whether a dietary risk still remained. A total of 202 samples of bakery goods were sampled from supermarkets and bakeries, consisting of cakes, muffins, scones and slices; as well as additional bakery goods such as doughnuts and bakery mixes. All samples were analysed for aluminium concentrations.

Compared to the 2016 NZTDS where all samples muffins and scones, and cakes and slices had in excess of 100 mg/kg aluminium, the greater proportion in the 2019 sampling had low (1-10 mg/kg) or not reported (<1 mg/kg) concentrations of aluminium. The consequential reduction in mean aluminium concentrations was 5-6 fold for both groups. Of the other bakery goods analysed only a small proportion of the bakery mixes had appreciable aluminium content. Stratifying the results of in-store bakeries and pre-packed bakery goods some continued use of SAlP was identified, however it appeared to have been largely phased-out from most product recipes.

Based on the reported aluminium concentrations an updated exposure assessment was undertaken for aluminium in the New Zealand diet. The large reductions in mean aluminium concentrations have led to a large reduction in the estimated exposures from that concluded in the 2016 NZTDS. As a result, the high intakes identified in the 2016 NZTDS for younger age group have been reversed and all population cohorts now have exposures below 50% of the health based guidance value. Industry engagement to phase-out the use of SAlP has thus mitigated the dietary risk identified for aluminium.

A proportion of bakery and pre-packed goods, including two bakery mixes, had aluminium concentrations that identified continued use of SAlP. To reduce the risk to brand or outlet-loyal consumers, further engagement to phase-out the use of SAlP is recommended. Continued testing in the NZTDS is identified as beneficial to ensure aluminium intakes remain within tolerable levels.

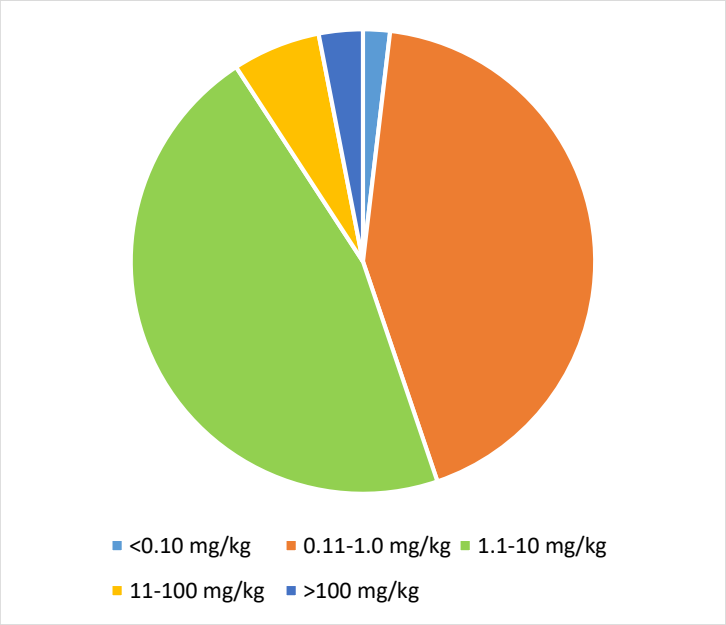
2 Introduction

2.1 ALUMINIUM IN THE 2016 NEW ZEALAND TOTAL DIET STUDY

The 2016 New Zealand Total Diet Study (2016 NZTDS; Pearson *et al*., 2018) analysed 132 different food types for a broad range of agricultural chemicals and important nutrient and contaminant elements. A new addition to the testing programme for the 2016 NZTDS was the chemical element aluminium. Aluminium had not been tested for previously in the NZTDS.

While aluminium was reported to be present in a large number of foods, typically the concentrations were less than 10 mg/kg (Figure 1.). A notable finding, however, was the detection of appreciable concentrations of aluminium in two of the bakery goods categories. Muffins and scones were found to have an average aluminium concentration of 704.5 mg/kg (range: 497-927 mg/kg) and cakes and slices an average concentration of 247.5 mg/kg (range: 120-359 mg/kg); both far in excess of any other food tested.

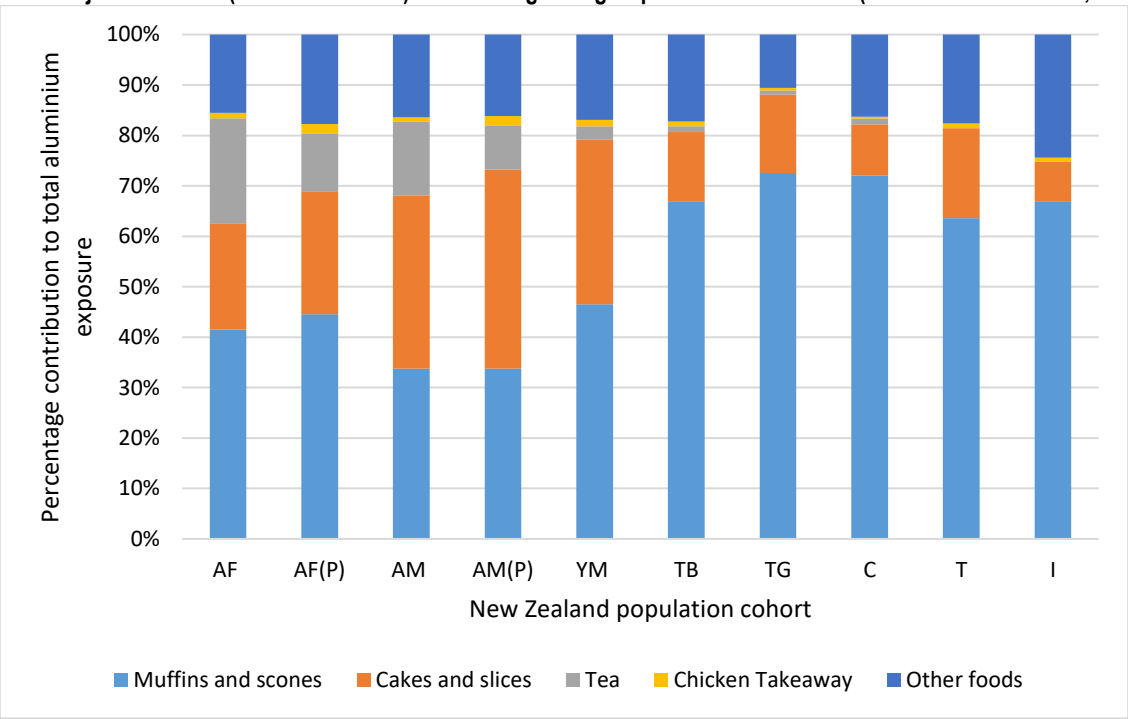
Figure 1: Range of aluminium concentrations in foods sampled in the 2016 NZTDS (Source: Pearson *et al*., 2018)



The significance of this finding was that these bakery goods were major dietary contributors to aluminium exposure across the population cohorts in the 2016 NZTDS (Figure 2). The resulting dietary exposure and risk characterisation established the estimated aluminium exposures for teenage girls, children, toddlers and infants exceeded the health based guidance value for aluminium intake (the World Health Organization provisional tolerable weekly intake (PTWI) is 2 mg/kg bw/day; WHO, 2011). Due to in-built safety factors in the PTWI it was considered unlikely that adverse health impacts would occur, however a potential non-negligible risk existed that prompted mitigation activities to be considered.

The source of aluminium was identified as originating from the use of sodium aluminium phosphate (SAlP) as a raising agent in bakery recipes or baking powders. SAlP is approved within the Australia New Zealand Food Standards Code for use in baked goods to levels consistent with good manufacturing practice. As no formal limit is set for the aluminium content resulting from SAlP use there is no regulatory target for food businesses to meet in terms of managing the concentration of aluminium in the finished food product.

Figure 2: Major aluminium (mid-bound mean)-contributing food groups in the 2016 NZTDS (Source: Pearson *et al.*, 2018)



AF: Adult Female (25 years and over); AF(P): Adult Female – Pacific Island ethnicity (15 years and over); AM: Adult Male (25 years and over); AM(P): Adult Male – Pacific Island ethnicity (15 years and over); YM: Young Adult Male (19–24 years); TB: Teenage Boy (11–14 years); TG: Teenage Girl (11–14 years); C: Child (5–6 years); T: Toddler (1–3 years); I: Infant (6–12 months).

2.2 INDUSTRY ENGAGEMENT

In June 2018 New Zealand Food Safety communicated with key industry groups managing the production of bakery goods to identify opportunities to reduce or phase-out the use of SAIP. With low aluminium alternatives available as raising agents for bakery goods it was considered that a broad phase-out of the use of SAIP would mitigate aluminium exposure in younger age groups but would not have an adverse impact on industry.

Industry agreed to reformulation of bakery recipes to remove SAIP and commenced a phase-out of its use over late 2018-early 2019. Feedback received by New Zealand Food Safety was that the majority of bakery recipes would be free of SAIP by April 2019.

2.3 FOLLOW UP SURVEY

To establish the impact of the voluntary phase-out on concentrations of aluminium in bakery goods a follow up survey was undertaken in April 2019. The purpose of the study was to establish typical ranges of aluminium present in bakery goods and estimate the success of the phase-out in mitigating the aluminium exposure.

An additional objective was to analyse a broader range of bakery goods than was possible in the 2016 New Zealand Total Diet Study to identify if any other food types should be targeted.

3 Methodology

3.1 SAMPLING AND ANALYSIS

To ensure a broad coverage of different bakery outlets, and both freshly baked and pre-packaged products, 200 samples were targeted to be collected. Although the focus was on sampling muffins, scones, cakes and slices, a number of other bakery goods such as banana bread, doughnuts, crumpets, English (split) muffins, premade pancakes and pikelets, were also targeted. Additionally, retail bakery mixes were also sampled.

In the first week of May 2019 a total of 202 samples were collected from 11 specialist bakeries and five supermarkets located in Hamilton. Sampling was predominantly of bakery goods produced on-site at independent bakeries and supermarket in-store bakeries (72%; 145 out of 202 samples). Pre-packed bakery goods, generally from independent food companies, sold in supermarkets made up the remaining 57 samples. The sample breakdown is presented in Table 1.

Table 1: Sample breakdown in a survey of aluminium concentrations in bakery goods

Bakery Good Type	In-store bakery samples	Pre-packed samples	Total Samples
Banana bread	6	0	6
Cake	45	13	58
Doughnut	6	1	7
English muffin	0	5	5
Mix	0	17	17
Muffin	33	0	33
Pancake/ Pikelet	1	7	8
Scone	16	0	16
Slices	38	14	52
Total	**145**	**57**	**202**

Samples were dispatched to Hill Laboratories in Hamilton for aluminium analysis by ICP-MS, the same method used in the 2016 NZTDS. The laboratory limit of reporting (LOR) for aluminium was 1 mg/kg. To ensure consistency with the use of the mid-bound mean in the 2016 NZTDS any findings below the LOR were substituted with 0.5 mg/kg.

3.2 EXPOSURE ASSSESSMENT

To assess the impact of the reported aluminium concentrations in muffins and scones, and cakes and slices an update exposure assessment was conducted. The exposure assessment model replicated that used in the 2016 NZTDS, replacing the mid-bound mean concentration of muffins and scones, and cakes and slices with the reported values in the present study. The exposure to aluminium from all other dietary sources considered in the 2016 NZTDS remained unchanged. Daily consumption rates for muffins and scones, and cakes and slice in the exposure model are presented in Table 2

Table 2: Mean daily food consumption (g) for bakery goods in simulated typical diets of the 2016 NZTDS (Pearson et al., 2018).

	Mean daily consumption (g)									
Food	Adult females	Adult females of Pacific Island ethnicity	Adult males	Adult males of Pacific Island ethnicity	Young adult males	Teenage boys	Teenage girls	Children	Toddlers	Infants
Cakes/ slices	13	14	26	30	26	7	11	4	4	1
Muffins/ scones	9	9	9	9	13	12	18	10	5	3

4 Results and Discussion

Analysis for aluminium was completed for all 202 samples (Table 3). A full table of results is presented in Appendix 1.

Table 3: Range of aluminium concentrations in sampled foods

Bakery Good Type	Samples	Samples <LOR	Aluminium mean concentration (mg/kg)*	Aluminium maximum concentration (mg/kg)
Banana bread	6	4	1	2
Cake	58	12	81	670
Doughnut	7	2	1	3
English muffin	5	2	1	2
Mix	17	3	134	1860
Muffin	33	6	89	340
Pancake/ Pikelet	8	2	2	3
Scone	16	1	135	1040
Slices	52	12	30	490

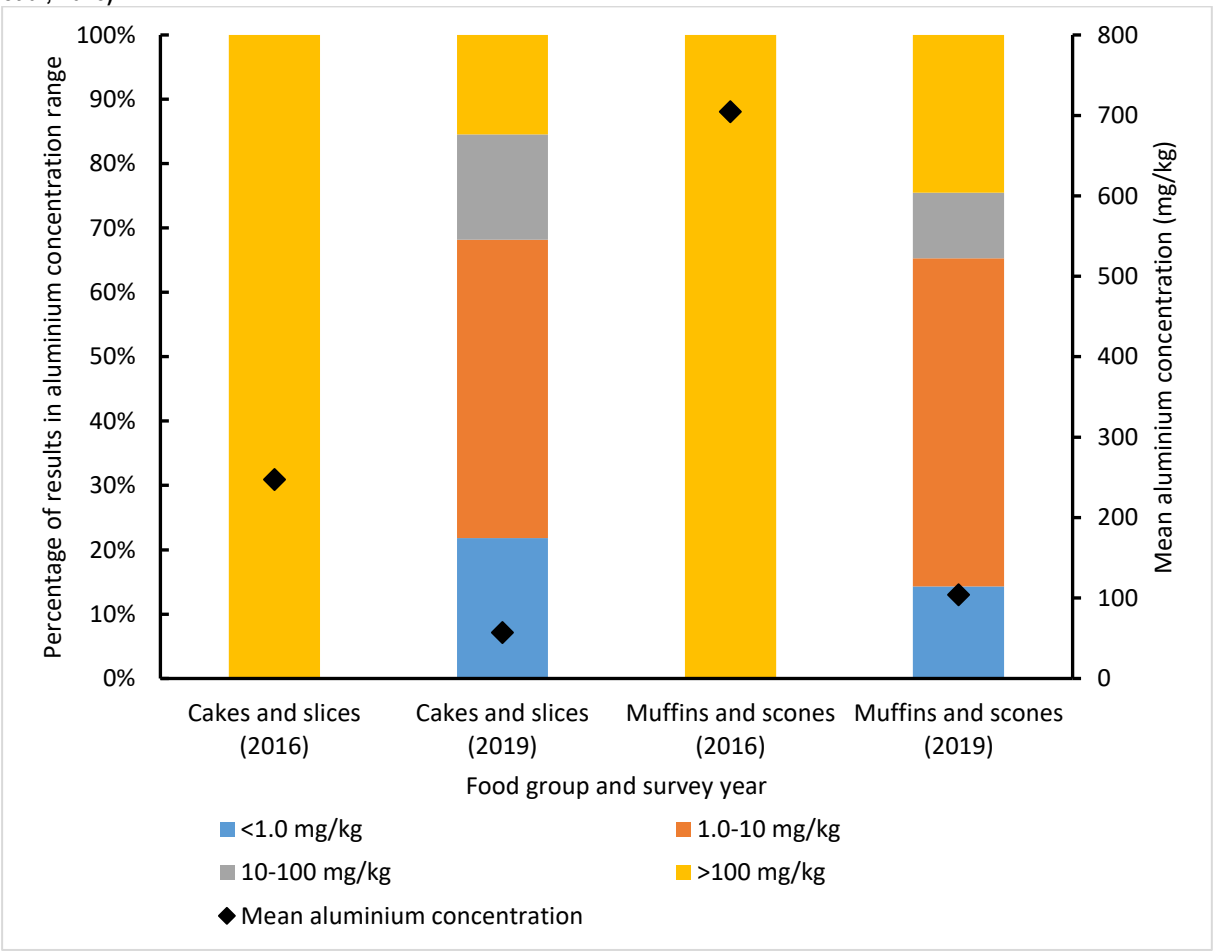
* Mid-bound mean where results <LOR substituted with ½ the LOR (0.5 mg/kg).

4.1 FOOD TYPES PREVIOUSLY SAMPLED

In total 159 samples were taken of muffins, scones, cakes and slices. All 16 results for muffins, scones, cakes and slices exceeded 100 mg/kg in the 2016 NZTDS. In contrast, in the present study only 18% of the results (29 out of 166 samples) exceeded 100 mg/kg of aluminium and 20% (31 samples) had no reported levels of aluminium. The change in concentration ranges from the 2016 NZTDS to the present survey are presented in Figure 3.

For both cakes and slices, and muffins and scones there was a large reduction in the mean concentration of aluminium over that reported in the 2016 NZTDS (Figure 3).

Figure 3: Ranges and mean of aluminium concentrations in sampled cakes and slices, muffins and scones (Pearson et al, 2018).



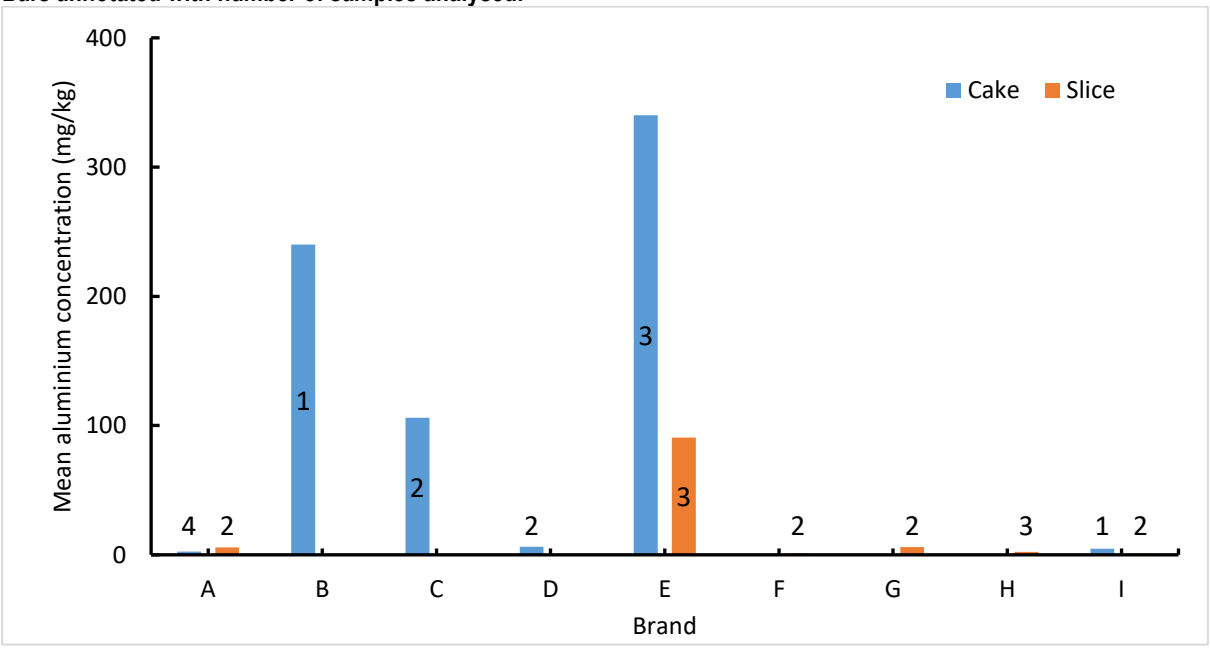
Examining the differences between outlets and commodities it can be seen that the majority of sampled outlets had low aluminium concentrations in freshly baked goods (Table 4), suggesting a general phase-out of SAIP from recipes. However, a few outlets had aluminium concentrations indicative of continued use of SAIP, this included scones at bakery F (940 and 1040 mg/kg) indicating possibly a high level of SAIP use. Comparisons between the outlets should be interpreted with caution given the sample types and number within each category were not consistent between retailers.

Table 4: Mean aluminium concentrations of in-store bakery cakes, slices, muffins and scones arranged by outlet.

Outlet	Identifier	Mid-bound mean aluminium concentration (mg/kg)			
		Cakes	Muffins	Scones	Slices
Bakery	A	93	1	Not sampled	9
	B	102	290	2	1
	C	1	135	Not sampled	2
	D	6	2	Not sampled	28
	E	38	1	Not sampled	3
	F	16	335	990	2
	G	1	2	Not sampled	1
	H	1	54	Not sampled	22
	I	24	Not sampled	Not sampled	291
	J	110	315	Not sampled	2
	K	34	300	2	3
Supermarket	A	4	3	68	Not sampled
	B	174	1	4	2
	C	245	2	9	36
	D	232	22	3	Not sampled
	E	11	2	7	54

For the pre-packaged foods, slices were generally low in aluminium, however cake samples from three brands indicated continued use of SAIP (Figure 4).

Figure 4: Mid-bound mean aluminium concentrations in sampled pre-packed cakes and slices, arranged by brand. Bars annotated with number of samples analysed.

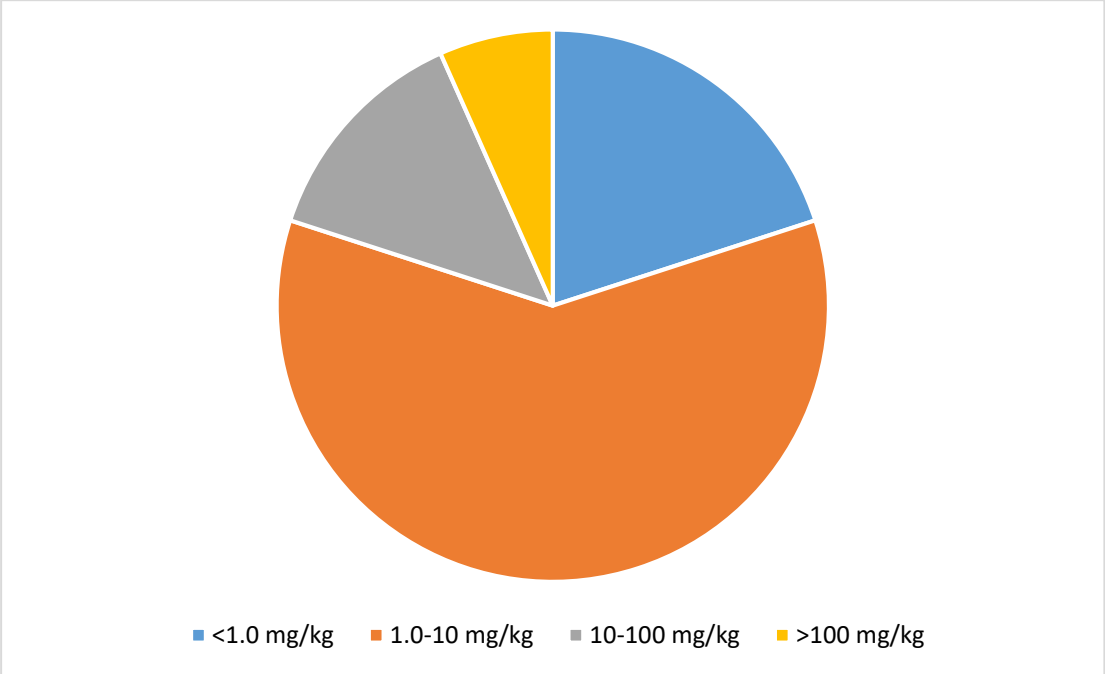


4.2 NEWLY SAMPLED FOOD TYPES

To identify if aluminium concentrations were of concern in other bakery good types approximately one fifth of the sampling focused on food types not sampled in the 2016 NZTDS. The five additional food types were banana bread, bakery mixes, English muffins, doughnuts and pancakes/pikelets. Of these groups only bakery mixes had samples with reported aluminium concentrations exceeding 5 mg/kg. This indicates that SAIP is unlikely to be in use in most other bakery goods.

For the bakery mixes the average concentration of aluminium of 134 mg/kg in 17 samples masks that the majority of samples were low in aluminium, as demonstrated by a median result of 4.8 mg/kg. Only four samples exceeded 10 mg/kg aluminium (Figure 5), with one sample containing 1860 mg/kg heavily skewing the mean.

Figure 5: Range of aluminium concentrations in 17 samples of bakery mixes.



Bakery mixes will be diluted with other ingredients during the preparation of recipes, although the level of dilution will differ between products and recipes. In general it would be expected that the aluminium concentration in the final product would be below 50% of that in the mix.

4.3 EXPOSURE ASSESSMENT

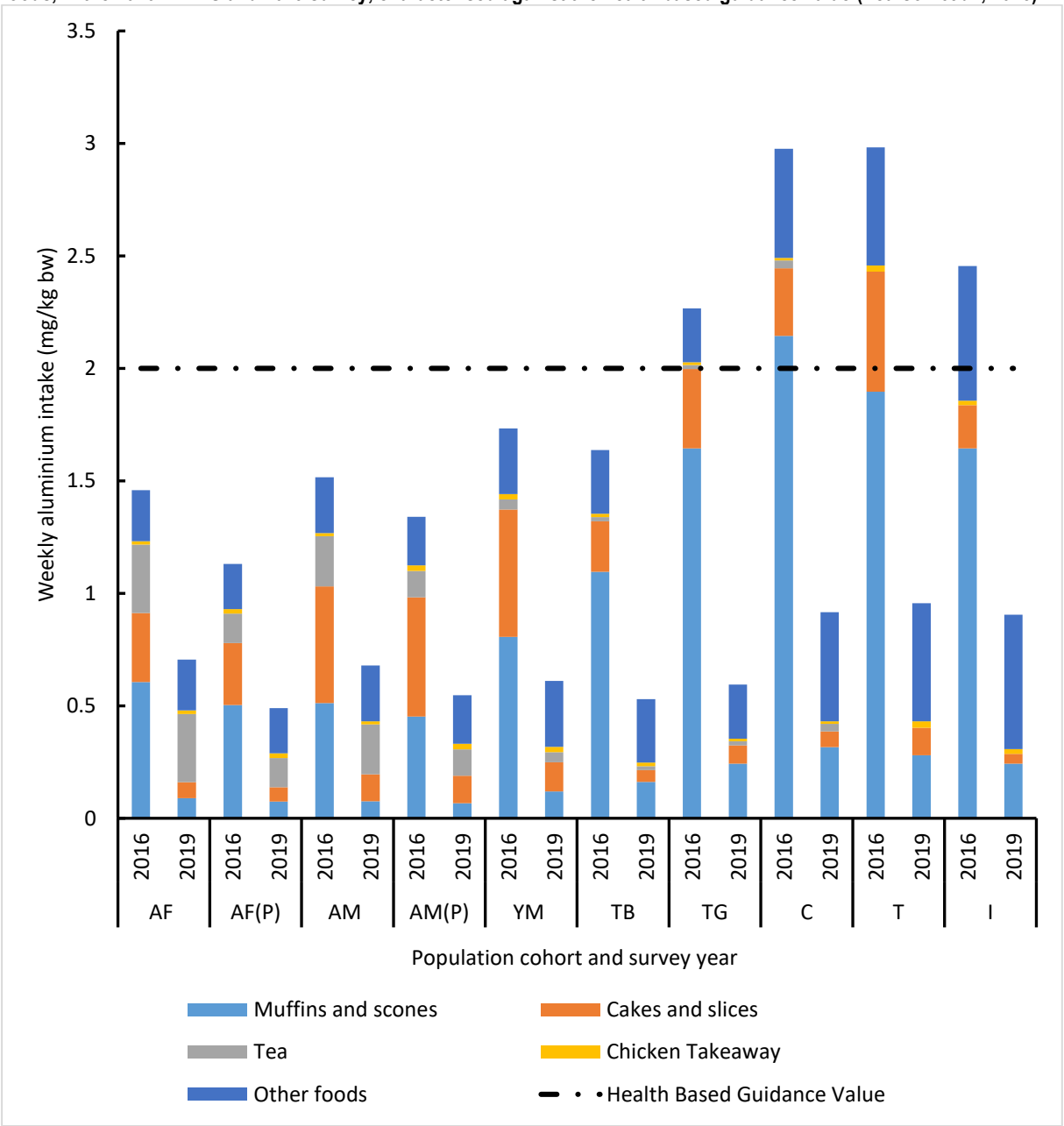
An updated exposure assessment was completed to account for the reductions in aluminium concentrations in muffins and scones, and cakes and slices. The large reduction reported in the average aluminium concentration of both bakery food groupings has led to a large reduction in the estimated weekly dietary intakes of aluminium in each of the NZTDS population cohorts (Figure 5). Total intake of aluminium reduced to between roughly 50% of that in the 2016 NZTDS for adult women to 25% for teenage girls. The highest estimated intake was for toddlers at 0.96 mg/kg bw/week, which had reduced from 3 mg/kg bw/week in the 2016 NZTDS.

The significance of the reduction in aluminium concentrations in the bakery goods in the present study can be visualised by examining the contribution to the overall intakes these represent (Figure 5.). In comparison to the 2016 NZTDS where muffins and scones, and cakes and slices contributed 63% of the aluminium in adult female intakes, with the updated concentrations these represent only 23%, with the contribution from tea (at 42% of total intake) now the most significant dietary source.

Although an exposure assessment was not conducted for the other bakery goods tested, it is expected that, with the exception of bakery mixes, given the low aluminium concentrations they would represent a minimal contribution to exposure. As the ingested aluminium from bakery mixes is contingent on any dilution from other ingredients in the recipe a definitive estimate of exposure is not possible. However for the bakery mix with the highest aluminium concentration (1860 mg/kg) assuming at least 50% dilution during preparation of the recipe would derive an ingested aluminium concentration in the

range of the concentration in muffins and scones from the 2016 NZTDS. As such frequent consumption could lead to comparable exposures as from muffins and scones in the 2016 NZTDS estimates.

Figure 5: Comparison of the estimated weekly aluminium exposures (mid-bound mean,) and contributions from key foods, in the 2016 NZTDS and 2019 survey, characterised against the health based guidance value (Pearson *et al.*, 2018).



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4.4 RISK CHARACTERISATION

The updated exposure estimates for aluminium were compared to the health based guidance value to characterise whether there was a dietary risk. Consistent with the 2016 NZTDS the World Health Organization PTWI of 2 mg/kg bw/week was used to inform a tolerable level of aluminium intake (WHO, 2011). In comparison to the outcomes of the 2016 NZTDS where the teenage girl, child, toddler and infant population cohorts had aluminium intakes in excess of the health based guidance value, all population cohorts based on the present study would have intakes at least two fold lower than the health based guidance value (Table 5).

Table 5: Estimated weekly exposures to aluminium in the New Zealand diet, characterised as a percentage of the World Health Organization Provisional Tolerable Weekly Intake (PTWI; WHO, 2011).

Population cohort aluminium exposure (mg/kg bw/week) and % PTWI									
Adult females	Adult females of Pacific Island ethnicity	Adult males	Adult males of Pacific Island ethnicity	Young adult males	Teenage boys	Teenage girls	Children	Toddlers	Infants
0.71	0.49	0.68	0.55	0.61	0.53	0.59	0.92	0.96	0.91
35%	25%	34%	27%	31%	27%	30%	46%	48%	45%

The updated risk characterisation indicates that the general population exposures to aluminium are unlikely to constitute a health risk. This establishes that the industry engagement on phasing out the use of SAlP has largely been successful in managing the identified dietary risk from aluminium. In addition, given the minimal aluminium found in most other bakery goods it is considered unlikely that there are unaddressed sources of aluminium in bakery goods contributing to a dietary risk

However, as the results identify some continued use of SAlP at both in-store bakeries and in pre-packed bakery goods, including a small number of bakery mixes, a potential dietary risk still remains for brand or outlet-loyal consumers. Continued engagement by New Zealand Food Safety with food manufacturers and industry groups to promote phase-out and replacement of SAlP in product recipes is recommended to ensure the residual risks to consumers are mitigated.

Repeated analysis for aluminium in future NZTDSs is also recommended to provide assurance the trends of aluminium exposure are decreasing and do not increase again present a potential dietary risk.

5 Conclusion

Analysis of 202 bakery goods for aluminium has identified an appreciable reduction in aluminium concentration since testing in the 2016 NZTDS, likely reflecting the phase-out of use of SAlP. Analysis indicates most in-store bakeries and pre-packed bakery goods are low in aluminium, however a small number indicate continued use of SAlP.

The reduction in aluminium concentrations has resulted in a decrease in exposure for all New Zealand population cohorts. Estimates of weekly exposure updated from the 2016 NZTDS identify a 2-4 fold decrease. Consequentially, all population cohorts are considered to have exposures to aluminium within tolerable levels, reversing the high dietary intakes in younger age groups identified in the 2016 NZTDS. A general conclusion of no appreciable dietary risk from aluminium can now be made for the general population

As a small proportion of in-store bakeries and pre-packed bakery goods apparently continue to use SAlP there is likely to be a residual risk for brand or outlet-loyal consumers. As a result continuing engagement by New Zealand Food Safety to promote the phase-out and replacement of SAlP in recipes is recommended.

6 References

Pearson, A., Gibbs, M., Lau, K., Edmonds, J., Alexander, D., Nicolas, J., 2018 The 2016 New Zealand Total Diet Study. MPI, Wellington.

World Health Organization (WHO), 2011. Evaluation of certain food additives and contaminants: seventy-fourth report of the Joint FAO/WHO Expert Committee on Food Additives (WHO technical report series; no. 966.) WHO, Rome.

7 Appendix 1: Raw data

Sampling location	In-store/ pre-packed	Bakery good group	Detail	Aluminium Concentration (mg/kg)
Bakery A	In-store	Cake	Banana	184
Bakery A	In-store	Cake	Carrot	1.4
Bakery A	In-store	Muffin	Apple	<1.0
Bakery A	In-store	Muffin	Blueberry	1.3
Bakery A	In-store	Muffin	Chocolate	2.5
Bakery A	In-store	Slice	Apricot	2.5
Bakery A	In-store	Slice	Caramel	3.4
Bakery A	In-store	Slice	Caramel	3.8
Bakery A	In-store	Slice	Chocolate	27
Bakery B	In-store	Banana bread		<1.0
Bakery B	In-store	Cake	Fruit	1.3
Bakery B	In-store	Cake	Fruit	5.4
Bakery B	In-store	Cake	Lamington	2.8
Bakery B	In-store	Cake	Lamington	1.2
Bakery B	In-store	Cake	Sponge	600
Bakery B	In-store	Cake	Red velvet	1.4
Bakery B	In-store	Doughnut		1.3
Bakery B	In-store	Muffin	Blueberry	290
Bakery B	In-store	Pancake/Pikelet		3.0
Bakery B	In-store	Scone	Cheese	4.1
Bakery B	In-store	Scone	Ham	<1.0
Bakery B	In-store	Scone	Sultana	1.5
Bakery B	In-store	Slice	Apricot	2.2
Bakery B	In-store	Slice	Citrus	<1.0
Bakery B	In-store	Slice	Ginger	1.8
Bakery B	In-store	Slice	Louise	<1.0
Bakery C	In-store	Cake	Carrot	1.9
Bakery C	In-store	Cake	Lamington	<1.0
Bakery C	In-store	Cake	Lamington	<1.0
Bakery C	In-store	Muffin	Apple	135
Bakery C	In-store	Muffin	Blueberry	135
Bakery C	In-store	Slice	Caramel	2.3
Bakery C	In-store	Slice	Ginger	2.6
Bakery C	In-store	Slice	Louise	<1.0
Bakery D	In-store	Cake	Chocolate	12
Bakery D	In-store	Cake	Passionfruit	<1.0
Bakery D	In-store	Muffin	Banana	1.8
Bakery D	In-store	Muffin	Passionfruit	1.7
Bakery D	In-store	Slice	Apple	14
Bakery D	In-store	Slice	Apricot	18
Bakery D	In-store	Slice	Ginger	58
Bakery D	In-store	Slice	Rocky road	21
Bakery E	In-store	Cake	Banana	3.4
Bakery E	In-store	Cake	Carrot	107
Bakery E	In-store	Cake	Chocolate	3.8
Bakery E	In-store	Muffin	Apple	<1.0
Bakery E	In-store	Muffin	Blueberry	1.4
Bakery E	In-store	Muffin	Chocolate	1.4
Bakery E	In-store	Slice	Caramel	2.1
Bakery E	In-store	Slice	Ginger	6.4
Bakery E	In-store	Slice	Citrus	1.7
Bakery F	In-store	Cake	Banana	3.9
Bakery F	In-store	Cake	Carrot	27
Bakery F	In-store	Cake	Chocolate	18
Bakery F	In-store	Muffin	Chocolate	330

Sampling location	In-store/ pre-packed	Bakery good group	Detail	Aluminium Concentration (mg/kg)
Bakery F	In-store	Muffin	Chocolate	340
Bakery F	In-store	Scone	Cheese	940
Bakery F	In-store	Scone	Date	1040
Bakery F	In-store	Slice	Chocolate	3.2
Bakery F	In-store	Slice	Citrus	1.8
Bakery F	In-store	Slice	Muesli	1.4
Bakery G	In-store	Cake	Banana	<1.0
Bakery G	In-store	Cake	Carrot	<1.0
Bakery G	In-store	Muffin	Blueberry	1.3
Bakery G	In-store	Muffin	Chocolate	1.8
Bakery G	In-store	Slice	Caramel	1.5
Bakery G	In-store	Slice	Caramel	<1.0
Bakery H	In-store	Cake	Banana	1.8
Bakery H	In-store	Cake	Carrot	<1.0
Bakery H	In-store	Muffin	Blueberry	59
Bakery H	In-store	Muffin	Chocolate	49
Bakery H	In-store	Slice	Chocolate	21
Bakery H	In-store	Slice	Chocolate	23
Bakery I	In-store	Cake	Banana	2.3
Bakery I	In-store	Cake	Carrot	65
Bakery I	In-store	Cake	Fruit	4.1
Bakery I	In-store	Doughnut		<1.0
Bakery I	In-store	Slice	Caramel	370
Bakery I	In-store	Slice	Caramel	490
Bakery I	In-store	Slice	Chocolate	11
Bakery J	In-store	Cake	Banana	<1.0
Bakery J	In-store	Cake	Carrot	<1.0
Bakery J	In-store	Cake	Lamington	330
Bakery J	In-store	Muffin	Blueberry	300
Bakery J	In-store	Muffin	Chocolate	310
Bakery J	In-store	Muffin	Chocolate	320
Bakery J	In-store	Slice	Chocolate	3.7
Bakery J	In-store	Slice	Lolly cake	<1.0
Bakery K	In-store	Cake	Banana	3.4
Bakery K	In-store	Cake	Carrot	64
Bakery K	In-store	Muffin	Chocolate	290
Bakery K	In-store	Muffin	Chocolate	310
Bakery K	In-store	Scone	Cheese	1.4
Bakery K	In-store	Scone	Date	2.9
Bakery K	In-store	Slice	Citrus	4.4
Bakery K	In-store	Slice	Caramel	2.3
Supermarket A	In-store	Banana bread		<1.0
Supermarket A	In-store	Cake	Chocolate	6.2
Supermarket A	In-store	Cake	Chocolate	2.4
Supermarket A	In-store	Muffin	Citrus	<1.0
Supermarket A	In-store	Muffin	Chocolate	4.8
Supermarket A	In-store	Scone	Cheese	53
Supermarket A	In-store	Scone	Date	82
Supermarket A	Pre-packed	Cake	Berry	2.0
Supermarket A	Pre-packed	Cake	Caramel	1.4
Supermarket A	Pre-packed	Cake	Chocolate	6.1
Supermarket A	Pre-packed	Cake	Cupcake	210
Supermarket A	Pre-packed	Cake	Gateaux	240
Supermarket A	Pre-packed	Cake	Lamington	2.3
Supermarket A	Pre-packed	Doughnut		3.1
Supermarket A	Pre-packed	English muffin		1.1
Supermarket A	Pre-packed	Mix	Banana bread	<1.0
Supermarket A	Pre-packed	Mix	Cake	7.6

Sampling location	In-store/ pre-packed	Bakery good group	Detail	Aluminium Concentration (mg/kg)
Supermarket A	Pre-packed	Mix	Cake	4.8
Supermarket A	Pre-packed	Mix	Muffin	310
Supermarket A	Pre-packed	Mix	Slice	8.1
Supermarket A	Pre-packed	Pancake/Pikelet		1.7
Supermarket A	Pre-packed	Pancake/Pikelet		1.5
Supermarket A	Pre-packed	Slice	Brownie	8.8
Supermarket A	Pre-packed	Slice	Brownie	2.0
Supermarket A	Pre-packed	Slice	Caramel	2.8
Supermarket A	Pre-packed	Slice	Cheesecake	<1.0
Supermarket B	In-store	Banana bread		<1.0
Supermarket B	In-store	Cake	Chocolate	200
Supermarket B	In-store	Cake	Lamington	<1.0
Supermarket B	In-store	Cake	Sponge	320
Supermarket B	In-store	Doughnut		1.5
Supermarket B	In-store	Muffin	Banana	<1.0
Supermarket B	In-store	Muffin	Blueberry	<1.0
Supermarket B	In-store	Scone	Cheese	2.1
Supermarket B	In-store	Scone	Sultana	5.3
Supermarket B	In-store	Slice	Caramel	2.0
Supermarket B	In-store	Slice	Berry	<1.0
Supermarket B	In-store	Slice	Rocky road	3.9
Supermarket B	Pre-packed	Cake	Carrot	<1.0
Supermarket B	Pre-packed	Cake	Sponge	230
Supermarket B	Pre-packed	English muffin		1.9
Supermarket B	Pre-packed	Mix	Cake	13
Supermarket B	Pre-packed	Mix	Muffin	5.7
Supermarket B	Pre-packed	Mix	Scone	3.0
Supermarket B	Pre-packed	Pancake/Pikelet		<1.0
Supermarket B	Pre-packed	Pancake/Pikelet		1.6
Supermarket B	Pre-packed	Slice	Berry	<1.0
Supermarket B	Pre-packed	Slice	Berry	<1.0
Supermarket B	Pre-packed	Slice	Caramel	1.3
Supermarket C	In-store	Banana bread		1.7
Supermarket C	In-store	Cake	Chocolate	240
Supermarket C	In-store	Cake	Cupcake	250
Supermarket C	In-store	Doughnut		1.1
Supermarket C	In-store	Muffin	Chocolate	2.6
Supermarket C	In-store	Muffin	Ham	<1.0
Supermarket C	In-store	Muffin	Nut	2.0
Supermarket C	In-store	Scone	Date	8.7
Supermarket C	In-store	Slice	Apple	<1.0
Supermarket C	In-store	Slice	Caramel	71
Supermarket C	Pre-packed	Cake	Chocolate	4.8
Supermarket C	Pre-packed	English muffin		<1.0
Supermarket C	Pre-packed	Mix	Banana bread	2.3
Supermarket C	Pre-packed	Mix	Cake	7.6
Supermarket C	Pre-packed	Mix	Muffin	1860
Supermarket C	Pre-packed	Slice	Cheesecake	1.5
Supermarket C	Pre-packed	Slice	Cheesecake	<1.0
Supermarket C	Pre-packed	Slice	Ginger	6.1
Supermarket C	Pre-packed	Slice	Lolly cake	<1.0
Supermarket D	In-store	Banana bread		1.4
Supermarket D	In-store	Cake	Chocolate	<1.0
Supermarket D	In-store	Cake	Sponge	670
Supermarket D	In-store	Cake	Red velvet	26
Supermarket D	In-store	Doughnut		<1.0
Supermarket D	In-store	Muffin	Chocolate	42
Supermarket D	In-store	Muffin	Citrus	1.7

Sampling location	In-store/ pre-packed	Bakery good group	Detail	Aluminium Concentration (mg/kg)
Supermarket D	In-store	Scone	Cheese	2.4
Supermarket D	In-store	Scone	Date	4.0
Supermarket D	Pre-packed	Cake	Citrus	360
Supermarket D	Pre-packed	Cake	Fruit	6.6
Supermarket D	Pre-packed	Cake	Fruit	6.0
Supermarket D	Pre-packed	Cake	Ginger	430
Supermarket D	Pre-packed	English muffin		
Supermarket D	Pre-packed	Mix	Cake	4.0
Supermarket D	Pre-packed	Mix	Cake	3.3
Supermarket D	Pre-packed	Mix	Cake	41
Supermarket D	Pre-packed	Slice	Berry	5.9
Supermarket D	Pre-packed	Slice	Brownie	270
Supermarket D	Pre-packed	Slice	Chocolate	6.0
Supermarket E	In-store	Banana bread		<1.0
Supermarket E	In-store	Cake	Carrot	1.5
Supermarket E	In-store	Cake	Cupcake	23
Supermarket E	In-store	Cake	Sponge	<1.0
Supermarket E	In-store	Cake	Red velvet	18
Supermarket E	In-store	Doughnut		1.6
Supermarket E	In-store	Muffin	Blueberry	2.3
Supermarket E	In-store	Muffin	Blueberry	1.9
Supermarket E	In-store	Scone	Cheese	5.7
Supermarket E	In-store	Scone	Date	7.7
Supermarket E	In-store	Slice	Brownie	54
Supermarket E	Pre-packed	English muffin		<1.0
Supermarket E	Pre-packed	Mix	Cake	<1.0
Supermarket E	Pre-packed	Mix	Muffin	<1.0
Supermarket E	Pre-packed	Mix	Pancake	1.1
Supermarket E	Pre-packed	Pancake/Pikelet		1.2
Supermarket E	Pre-packed	Pancake/Pikelet		<1.0
Supermarket E	Pre-packed	Pancake/Pikelet		1.9